Flexible Distributed SBA

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Agenda

- Key Defense Concepts Fueling Current SBA
- M&S Problems
- SBA Toolbox
- An Integrated Battlespace Example
- Summary

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The Future Needs Integrated Processes

- Integration of the process dependencies, such as between C2, targeting and Intel, is limited, and usually accomplished by man-in-the-loop
  - Many programs provide modeling and simulation of unique applications of platforms, sensors and missions
  - Else there is limited automation of processes across multiple federates requiring large network configurations, such as with Joint Simulation System (JSIMS)
- Small footprint (6 or so machines), integrated battlespace and processes are needed to allow SBA efforts

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Key Defense Concepts Fueling Current SBA Efforts

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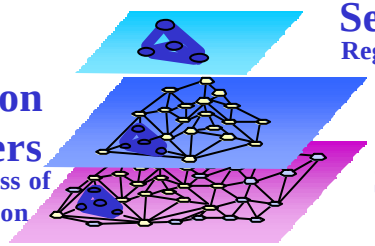
Key Considerations in Simulating C4ISR

Network Centric Warfare



Sensors
Regardless of Platform

Decision Makers
Regardless of Location

Shooters
Regardless of Service

Mr. John Garstka
DoD Office of Transformation
22 April 2002

If *Integrated C2ISR* is the end state…

U.S. AIR FORCE

Key Platforms		Seamless Capabilities	Integrated ISR COP
JSTARS, AWACS, Rivet Joint, Global Hawk, Predator, U-2, KE-X, Space-Based Radar, DSP/SBIRS, NTM	MC2A	GMTI, AMTI, ELINT, COMINT, MASINT, IMINT	Fused target picture, Automated target recognition, Target tracking, Positive target ID, Mensurated coordinates, Warnings and indicators, Situational awareness, Pred Battlespace Awareness

System Engineering & Integration

System Engineering & Integration

COMMAND & CONTROL

MC2A

DCGS/ GCCS

CDL/Link 16

DSCS/ COMSAT

New Goal

…n of Integrated Capabilities

…ervice - Excellence

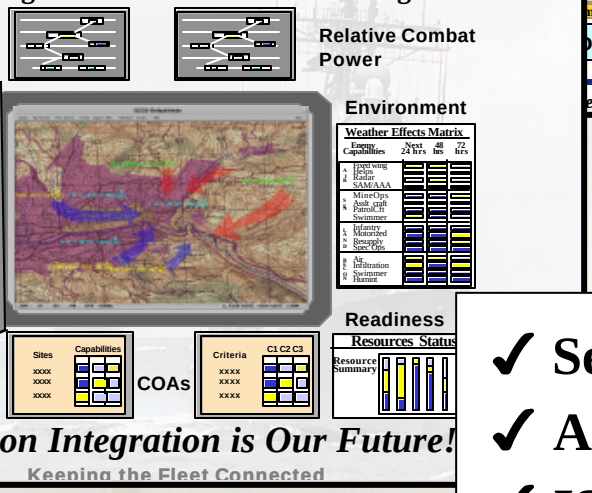
4

Integrated Information Baseline: the Vision

SPAWAR

NDIA

Access to Integrated Information From A Single Window



…ion Integration is Our Future!

Keeping the Fleet Connected

Army Intelligence Vision

Army Intelligence Vision

Transformed Army Intelligence Team projecting knowledge at the point of decision empowering the Objective Force to ...

… See First …
Understand First …
Act First …
Finish Decisively!

National - Joint - Combined

- ✓ Sensor Correlation
- ✓ All-Source Fusion
- ✓ ISR Integration

Joint C2 Synthesis

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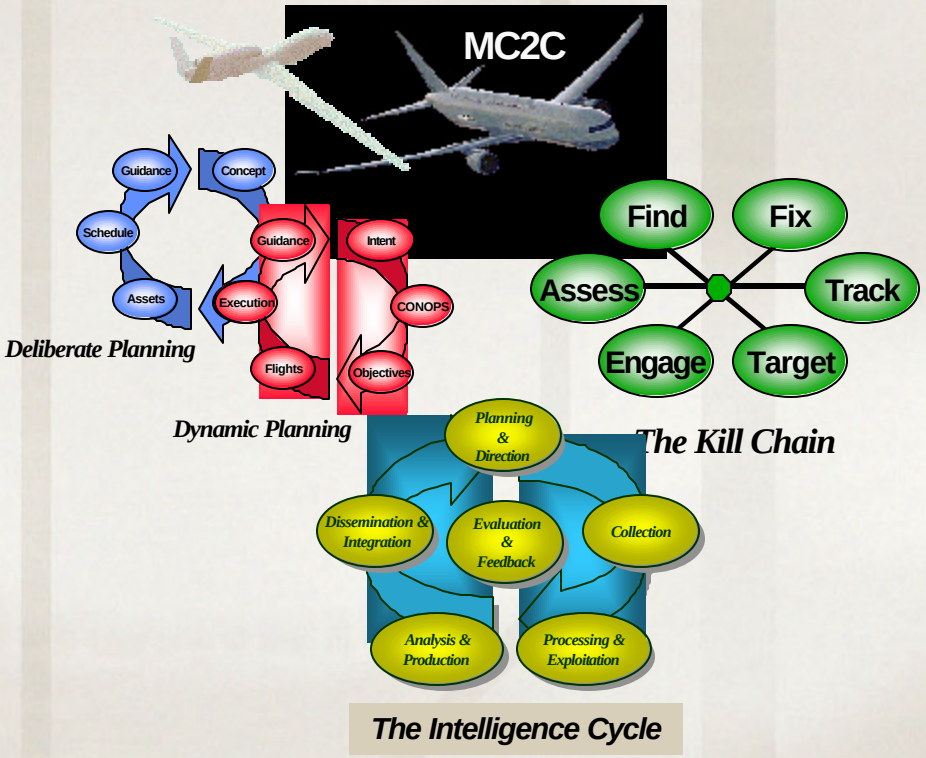
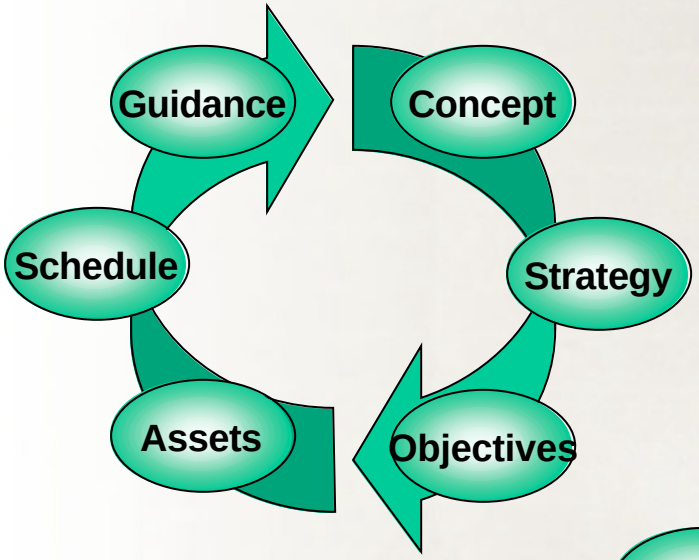
Advanced concepts call for a tighter coupling of decisionmaking, shooter, and sensor processes…within a networked national-to-tactical architecture .

- Model basic flagship processes
  - -Intelligence
  - -Fires
  - -Operations
- Define proposed linkages
  - -Airspace Management
  - -Sensor-to-shooter
  - -Battlespace Awareness
- Place within larger architecture
  - -War to SCC
  - -Joint fires
  - -Dynamic sensor cross-cueing
- Link objects to requirements and cost

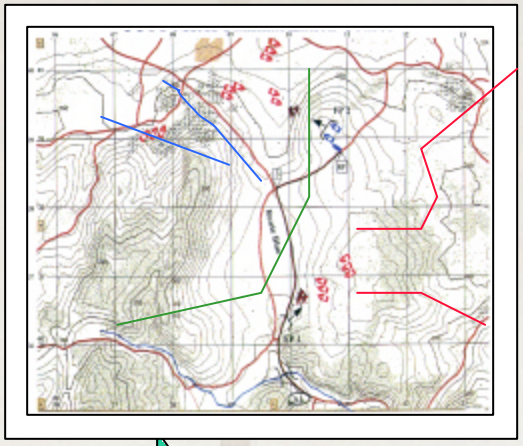


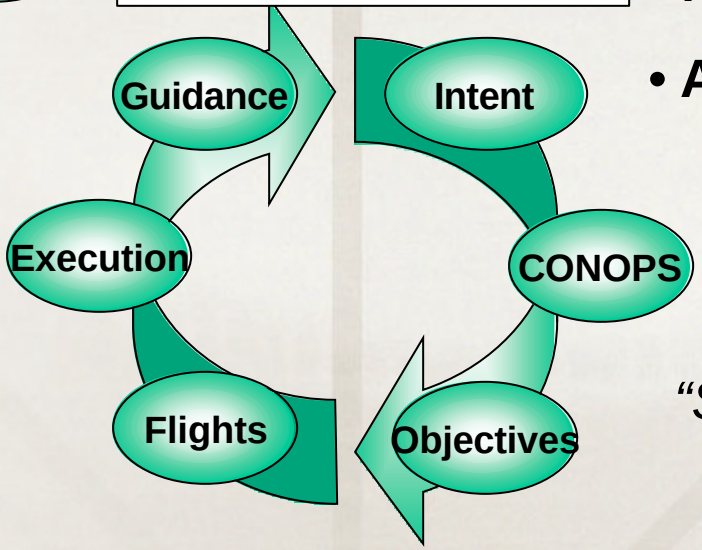
Command & Control Processes

Predictive Battlespace Awareness



Deliberate Planning





Dynamic Planning

Accounting for the consequences of first contact . . .

- **Linked to the ATO**
- **Threat actions**
- **New Guidance**
- **Airspace Management**
  - **redirection**
  - **auto route planning**
  - **deconfliction**

"Stay inside the Threat Decision Cycle"

Transition: Air Operations Center to Dynamic Battle Control Center

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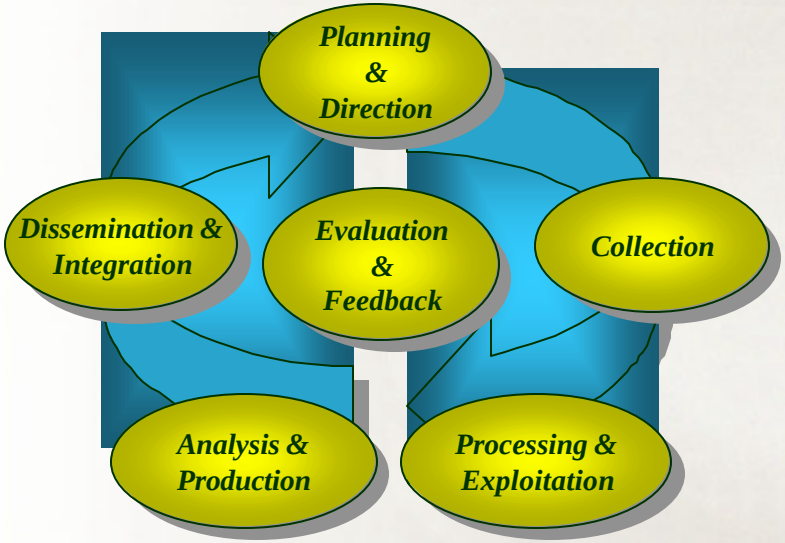
Intelligence Process

C4ISR performance should be measured according to performance within an intelligence cycle. . . in an integrated battlespace. . . from the perspective of the user.



The Intelligence Cycle

Intelligence is relevant to the extent it is actionable

Define measurable standards with respect to:

-Sensors
-Sensor Systems
-Architectures
-User Processes

Quality is defined by adherence to measurable standards

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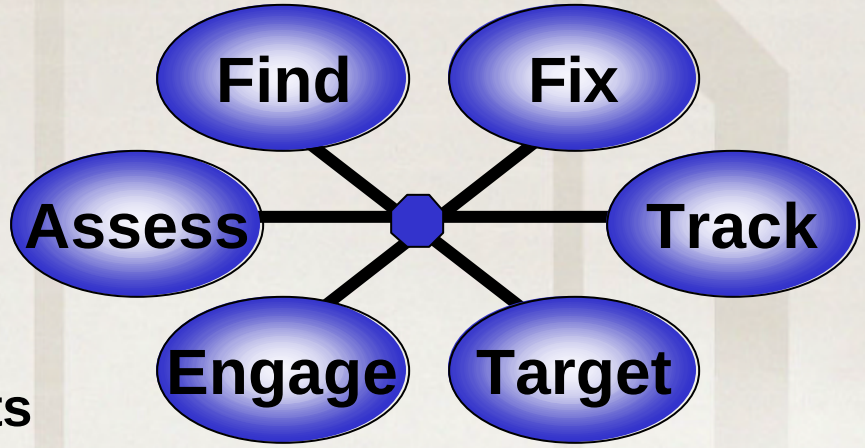
Targeting Processes

Accounting for. . .

- **Joint Targeting Board Links**
  - **Priority Target Lists**
  - **Determination Processes**
- **Air Targets**
- **Mobile and Fixed Ground Targets**
  - **Signature and CCD impacts**
- **Time-Critical Targeting**
- **Weapons Pairing**
  - **lethal and non-lethal**
- **Combat Assessment**
  - **dynamic links to ISR**



The Kill Chain

Wolfpack ISR Applications. . .
Determine and assess behavioral and physical systems dependencies

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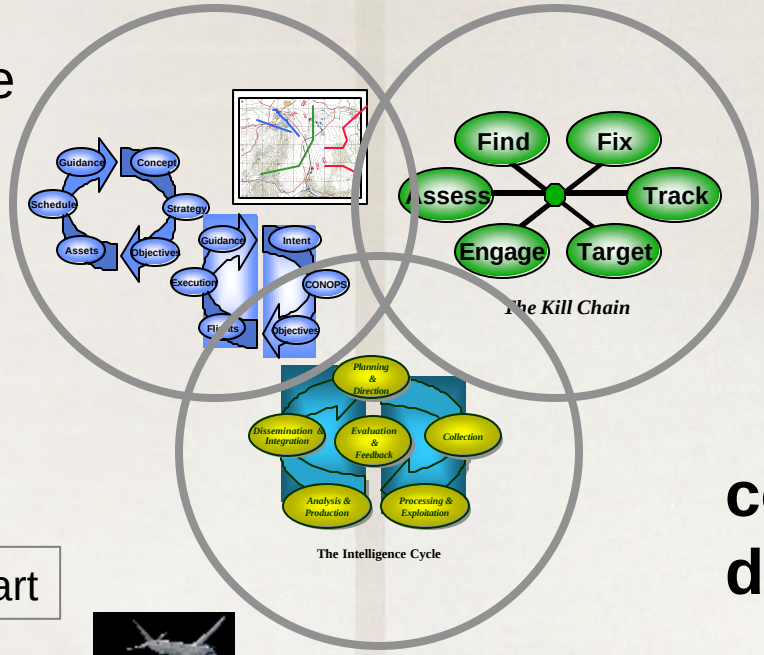
Process Synthesis

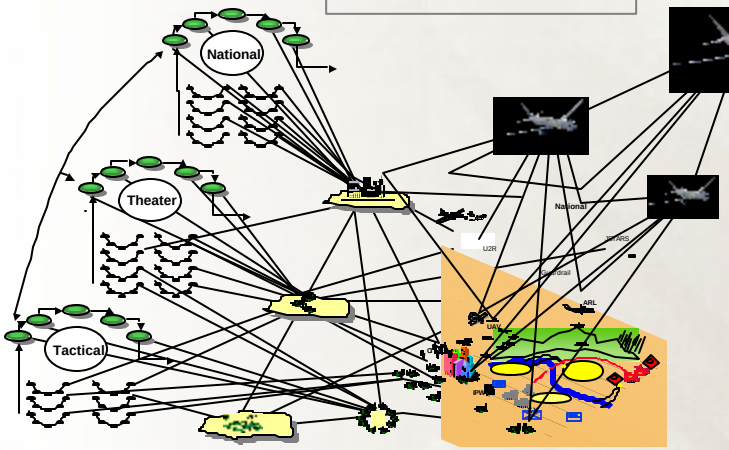
- ATO Monitoring
- Predictive Battlespace Awareness
- Dynamic Airspace Management



- Links to Joint
- Time-critical Targeting
- Combat Assessment

Simulate compatible, data-driven processes allowing measurements in minutes and meters.

ISR Headstart



- Pervasive ISR
- Specific Taskings
- Dynamic cross-cueing

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M&S Problems

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Knowing the Problems

- There are specific, key considerations in simulating C4ISR capabilities and processes, to maximize measuring a systems operational effectiveness and mission performance
  - Must be modeled as both a single system and as a major C4ISR component of a larger system of systems architecture
  - Understand and simulate, not emulate, the behaviors of each sensor and platform
  - Model and integrate the processes and flow of data
- Proper modeling and validation of behaviors requires Intel, Command and Control, and Targeting Subject Matter Experts (SMEs) that provide
  - User perspectives and assessment on M&S scenarios, behaviors, applications and integration
  - Validated parametric data used to instantiate specific platforms and/or sensors

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SBA Toolbox

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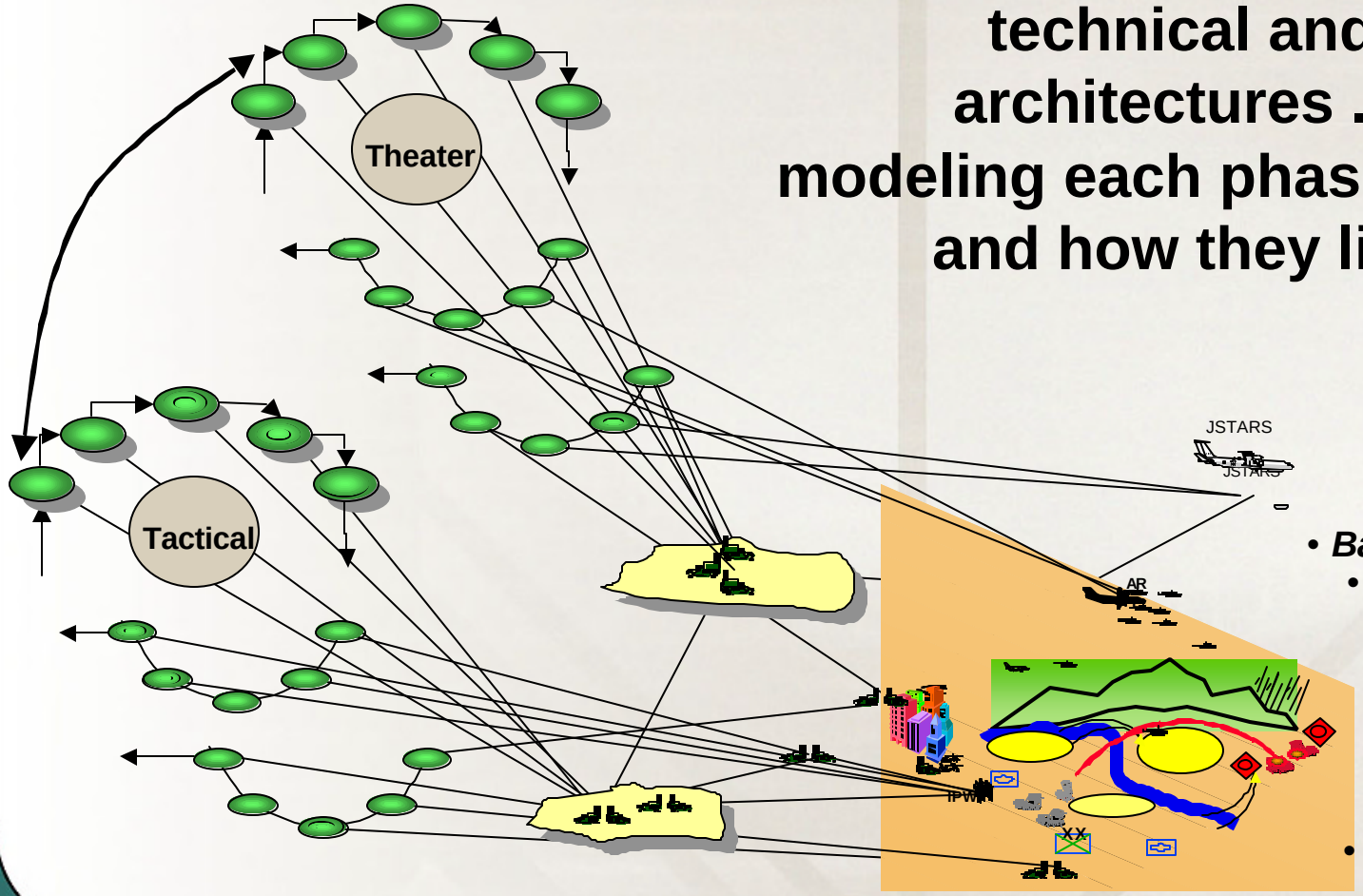
Model the architecture and processes

Battlespace simulation needs to accurately model the processes and behaviors of the platforms and sensors

Combine combat platforms and sensor systems to form specific technical and operational architectures . . . uniquely modeling each phase of process and how they link together.



Validate and benchmark:

- *Battlespace interactions*
- *Communications flow*
- *Process integration*
- *Model behaviors*
- *Cross-cueing*
- *Cost model*
- *Output reporting*
- *Effectivity measures*
- *Performance measure*

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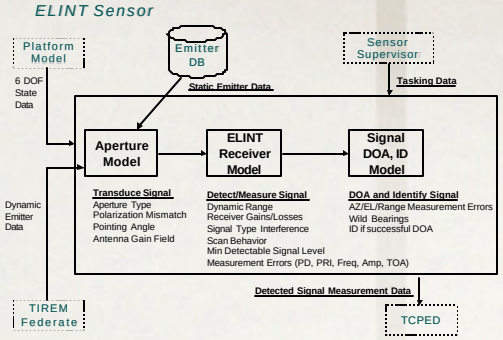
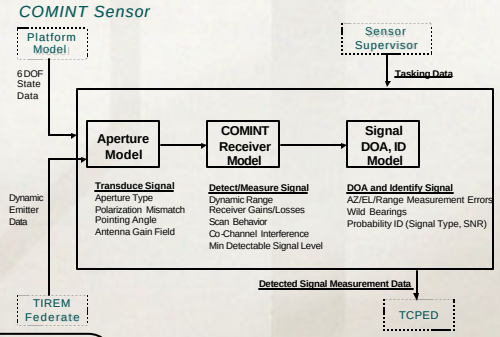
Veridian's reconfigurable models have generic parameters that can be programmed to represent different instantiations of platform/C4ISR system combinations for single or multi-ship missions

- 2D and 3D aircraft visualization models
- Environmental model
- Flight dynamics model
- Active sensing radar
- Moving target indicator
- Electro-optical (visual)
- Infra-red (FLIR, line scanner, hyper spectral)
- ELINT
- COMINT
- Communications/reporting
- Tasking, cross-cueing, throughput

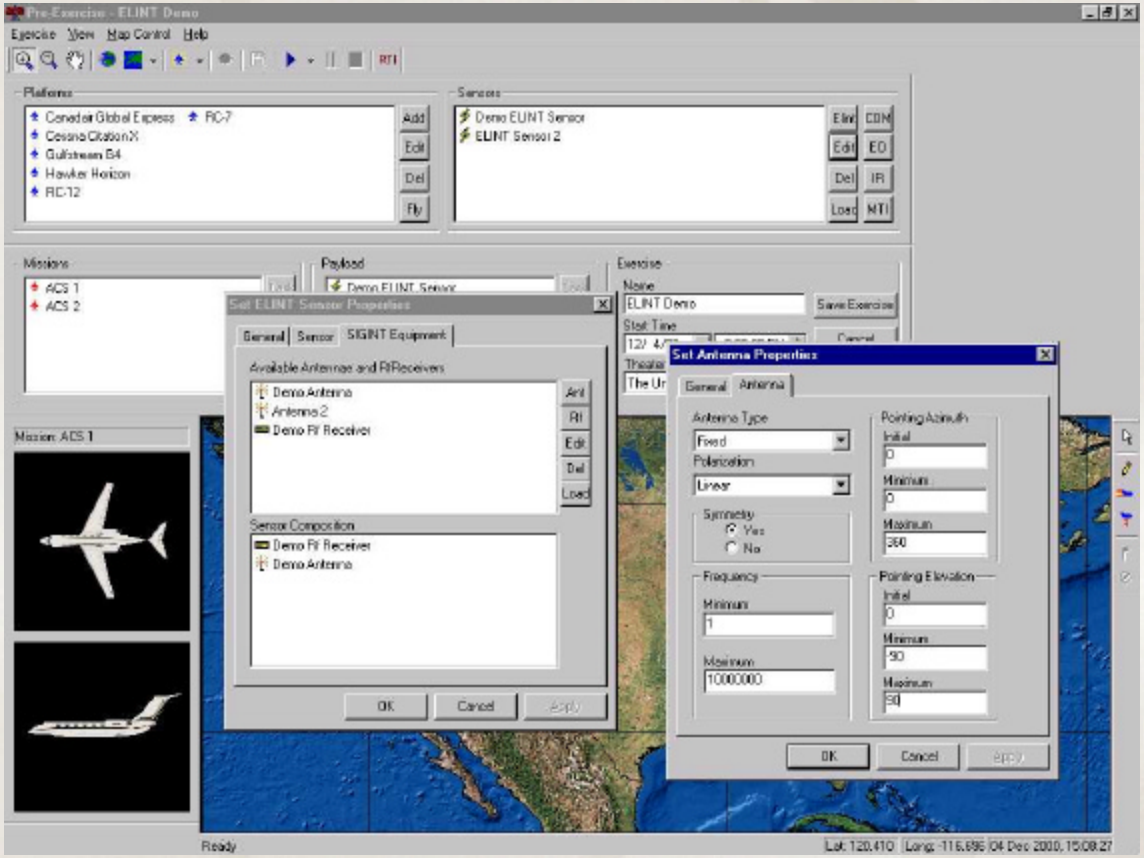




Veridian's HLA test bed incorporates an extensive suite of proven platform, environmental, and C4ISR models

Reconfigurable Sensor / Platform / Mission Planner

- Supports single or multi-ship missions
- Easily configure any combination of platforms, C4ISR sensors, and sensor packages
- Graphically plot mission waypoints
- Dynamically track scenario progress



Existing configuration tools simplify platform/C4ISR configuration and mission planning

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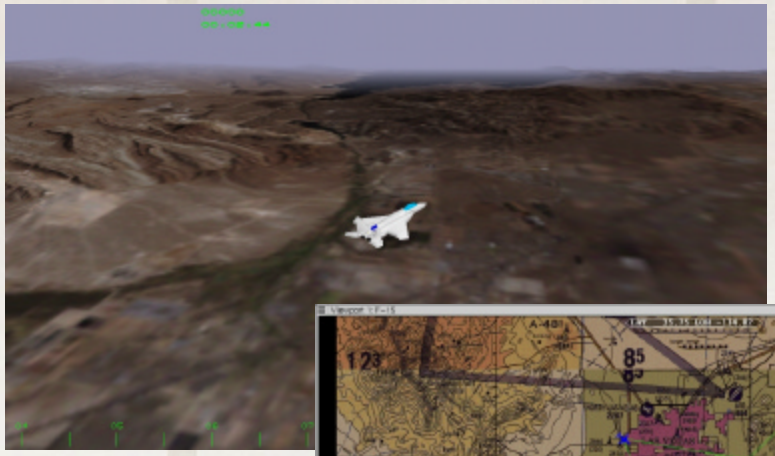
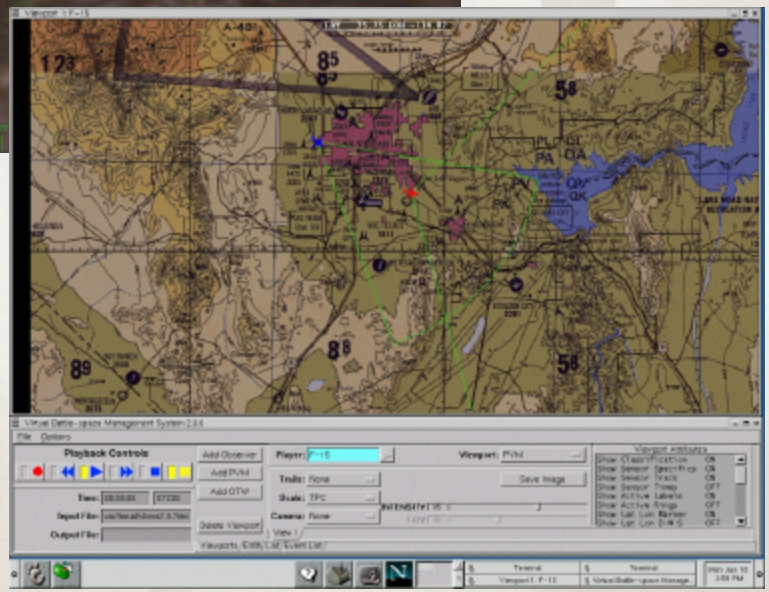
Virtual Battlefield Management System (VBMS)

- Provides both 2D and 3D perspectives of the battlespace
- Easily reconfigurable
- Multi-mission capable
- Provides AAR capability as well as debug utility
- Plot target/emitter locations, sensor ranges, ID's, detections, engagements, etc.





Utilization of existing tools and technologies lowers cost and reduces schedule risk

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Testing & Evaluation

- Enables Systems of Systems (SOS) testing
  - Airborne and spaced-based systems
  - Technology risk
- Architecture options
  - Interoperability testing
  - Modification assessment
  - Multiple platform testing
  - Operational analysis
  - Communications/sensor conflicts
- Platform and sensor model validation
- Unlimited threat assessment
- Testing not Geo-limited
- Test scenario development

Support for a wide range of DT&E and OT&E applications

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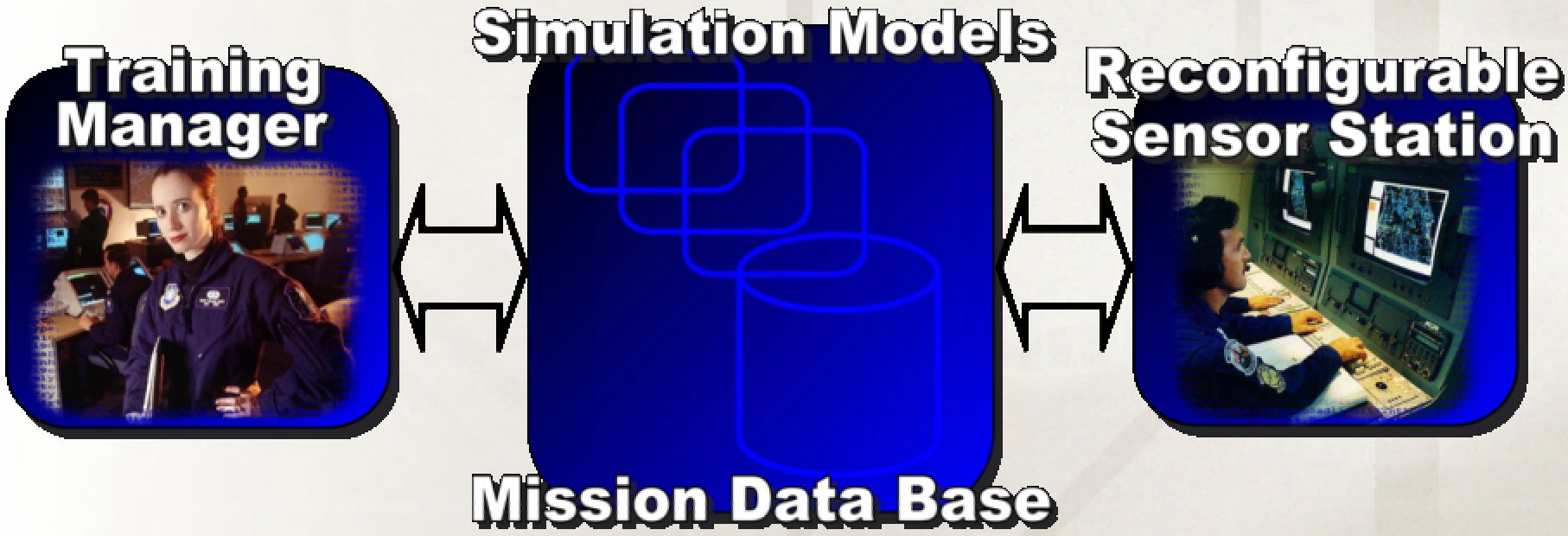
Veridian models can further be used to support training requirements, including:

- Tactics development
- Situational awareness
- Distributed mission training
- Virtual trainers



An Integrated Battlespace Example

Simulation Concepts

➢ Operational Models

– Sensors and platforms

- Integrates C2, Targeting and Intel processes

• GLOBAL HAWK

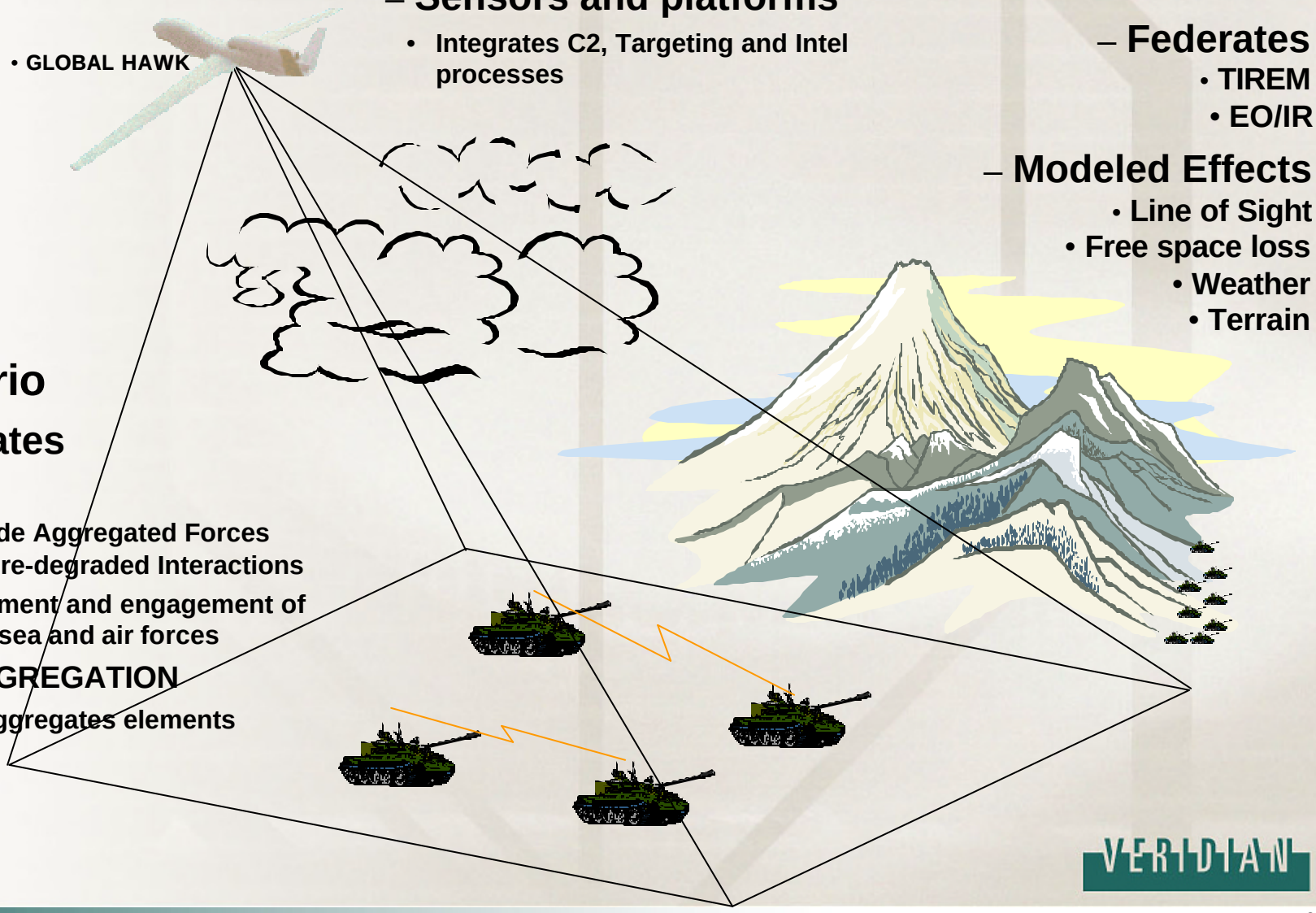
➢ Synthetic Environment

– Federates

- TIREM
- EO/IR

– Modeled Effects

- Line of Sight
- Free space loss
- Weather
- Terrain



➢ Scenario

– Federates

- RAID
  - Provide Aggregated Forces and Pre-degraded Interactions
  - Movement and engagement of land, sea and air forces
- DISAGGREGATION
  - Disaggregates elements

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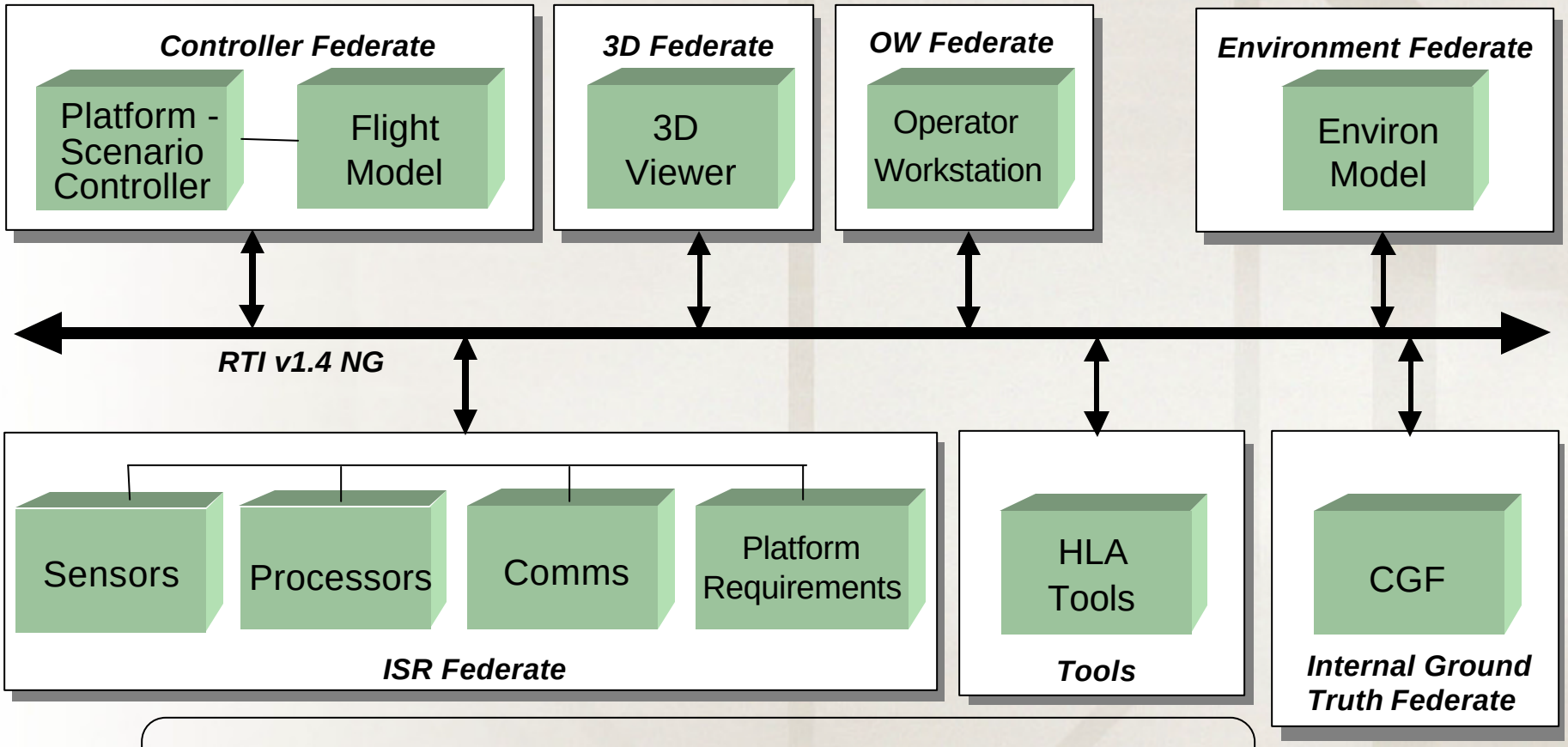
Veridian's Scalable High Level Architecture (HLA) Environment



Veridian's HLA Test Bed is readily reconfigurable through the addition of other federates to meet customer needs

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Summary

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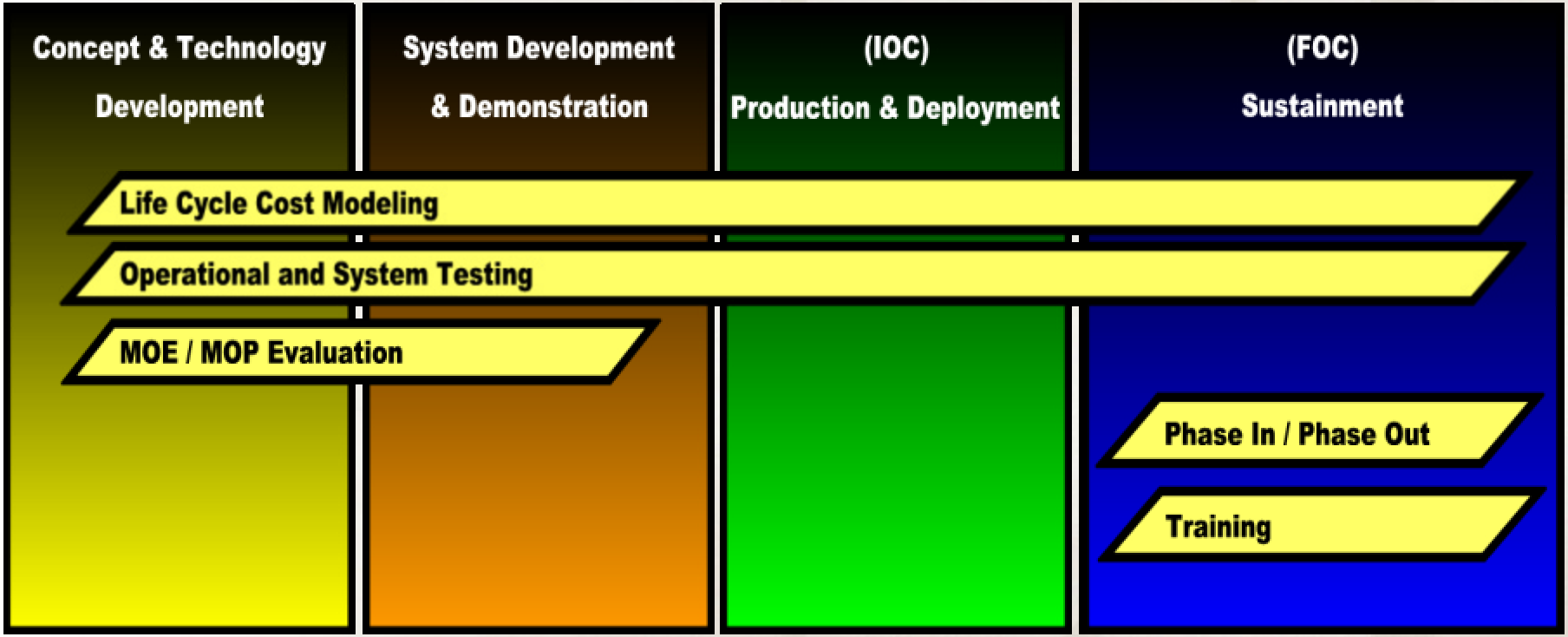
Life Cycle Support

A Reconfigurable Test Bed and SBA experience can provide support from concept development, through IOC and into the future.



SBA supports the entire program life cycle

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Conclusion

- SBA efforts are limited in supporting large, complex acquisitions until SBA tools
  - Provide battlespace scenarios whose models implement and utilize validated, integrated C2, targeting and Intel processes
  - Incorporate a smaller, manageable configuration
- Veridian is developing the solution in their RAID simulation tool

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